9. LITHIC ANALYSES

In this chapter we continue to examine technological traits, first through tables and then in a multidimensional context. Flake technology and material distributions are examined first to discover the range of materials used. Next, the wide range of unusual tools, in addition to points, found in the Archaic levels are examined. The Woodland levels contained a more usual complement of points and ceramics.

FLAKES

Because of their numbers, flakes have great potential to define the technological context of a site over time and suggest the functional character of site assemblages, loci within sites, and temporal variations in site function. Flakes and flake fragments can signal use characteristics of sites. The technological approach of visitors to the sites can vary, such as between core and biface flake removal techniques for importing and generating flakes. These in turn are thought to imply different mobility and cultural tendencies of site inhabitants.

Core and Biface Flakes

The proportion of core and biface flakes is generally thought to be an indication of the mobility of the populations occupying a site. Bifacial cores and bifacing techniques are posited to be the preferred gear of mobile societies or groups of people from sedentary societies on mobile missions. Biface cores are easily portable and readily converted into tools, whatever their nature, at the point of use. Bifacing technology is the prehistoric equivalent of just-in-time delivery of manufactured goods. Like its modern international derivative, it implies no on-site inventory that demands undeterminable storage and transportation costs. The bifacing technique requires an extra step of preparation; bifacial cores are made at a quarry site and taken on the expedition. There, in appropriate circumstances, they are converted into tools conforming to the functions at hand (Goodyear 1989; see Glover 1998 for review of literature). Core flakes mark the earlier stages of flake manufacture and thus suggest a nearby source of lithic raw material, or perhaps that more sedentary societies might not take the step of bifacial core preparation and instead make flakes directly from raw material, thus saving labor costs.

In the Neuse Levee assemblage 4,590 flakes could be identified as either of core or biface technology: that is, a platform was present and the bifacing could be distinguished by a V-shaped platform. As in previous studies of Neuse Fall Line sites, biface flakes were judged conservatively to achieve the best possible estimate of bifacing activity.

Eighty-four percent of the overall Neuse Levee assemblage was of core flaking origin (Table 9.1). The Wakefield Creek sites provide a comparative outlook on these figures. In the analysis of the Wakefield Creek sites, 31WA1380 generally emerged as a base camp, while Red Hawk Run (31WA1376) and 31WA1390 were found to be special use stations. Both special use stations display a low 75% core flakes, while the base camp has 80% core flakes. The Neuse Levee flake assemblage contains even greater proportion of core flakes. The difference between each of the sites is not great (about 5%). However, the higher proportion of flakes at Neuse Levee, following the core-biface model, suggests overall a relatively stable occupation situation at Neuse Levee. This assumption might be compromised somewhat by the evident local availability of material at Neuse Levee, but at least some raw material was also available at the Wakefield sites.

Table 9.1. Core and Biface Flake Proportions for Neuse Levee and the Wakefield Sites.

Flake Type	31WA1137	31WA1376	31WA1390	31WA1380	Total
Core	3841	262	474	160	896
Biface	708	88	154	39	281
Total	4549	350	628	199	1177
% Core	84	75	75	80	
% Biface	16	25	25	20	
Total	100	100	100	100	

In the Wakefield analysis we did not have the opportunity to check the relationship between core-biface and material characteristics because they were coded in separate data bases. This problem was corrected in this study. The hypothesis of interest relative to core-biface technology and material is that, if bifacing technology indicates mobility, then the larger bifacing flakes should be on exotic material. The concept provides a cross-check that reinforces the core-biface mobility hypothesis. If the bifacing flakes are mostly on imported material, then the inhabitants of the site brought exotic materials with them as bifacial cores, which supports the mobility hypothesis. In another perspective, without precise coding of the relationship between core-biface technology and material, the possibility could not be eliminated that core flakes were simply an early-stage product of the bifacial core preparation process, inherently weakening the core-biface mobility argument. If core and biface flakes were all on the same local material, it could imply that all flake manufacturing was done locally and perhaps that the population was sedentary.

Observing the core-biface technology and materials types in a combined data set at Neuse Levee revealed that greater than expected numbers of biface flakes are of chert (Table 9.2), a clearly non-local material (Lautzenheizer and Eastman 1996). On the other hand, less than expected frequencies of biface flakes are of locally available rhyolite and quartz. This provides a strong argument for biface flaking being associated with non-local origins and that bifacing is an indicator of greater mobility.

Approximately the expected number of core flakes was found of rhyolite and more than expected of quartz, probably also locally available. Core flaking is therefore implicated as a local and possibly more sedentary indicator.

Table 9.2. Core-Biface Flakes x Material Types Cross-Tabulation.

Flake Type		Material Type				
		Rhyolite	Quartz	Quartzite	Chert	Total
Core	Count	3841	80	20	117	4058
	Expected	3796.8	67.6	18.4	175.3	4058
Biface	Count	708	1	2	93	804
	Expected	752.2	13.4	3.6	34.7	804
Total	Count	4549	81	22	210	4862
	Expected	4549	81	22	210	4862

Chi-square=134.9, df=3, p<.0001.

Within the overall Neuse Levee core-biface frequencies are level-by-level changes over time. Given the relatively high stratigraphic resolution and large flake sample of Neuse Levee, level changes could provide key insights to both the overall Neuse Levee mobility index and those at Wakefield Creek. Wakefield Creek is presumed to be an inherently more mobile situation because of the broken terrain. Using the 20% of depth levels, it can be seen that core and biface technology traded off at least twice over the period of the site's occupation (Table 9.3). Higher than expected core technology values are

Table 9.3. Core/Biface Flakes x Depth 20% Levels Cross-Tabulation.

Flake Type		**Depth, 20% Levels**					
		<20	**20–40**	**40–60**	**60–80**	**>80**	**Total**
Core	Count	170	247	1059	1599	973	4048
	Expected	208.6	268.7	1030.6	1607.2	932.9	4048.0
	20% level	68.0%	76.7%	85.7%	83.0%	87.0%	83.4%
Biface	Count	80	75	176	327	145	803
	Expected	41.4	53.3	204.4	318.8	185.1	803.0
	20% level	32.0%	23.3%	14.3%	17.0%	13.0%	16.6%
Total	Count	250	322	1235	1926	1118	4851
	Expected	250.0	322.0	1235.0	1926.0	1118.0	4851.0
	20% level	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Deposition Rate		Medium	Medium	High	Redeposition/ Erosion	Low	

Chi-square=69.2, df=4, p=.0001.

interrupted by high biface values once during the Archaic (60–80% level). After a return to high core values in the late Late Archaic, high biface values maintain through the Woodland. It could be that the periods of high mobility are a function of something as simple as frequent flooding at the Neuse Levee, and thus no permanency of occupation. However, no consistent, replicated pattern appears between technology and deposition rates, which would be expected if the cause were something as definitive as frequent flooding (see Table 9.3 and Chapter 11 for explanation of deposition rates). At a depth of 40–60%, the high deposition rates associated with high core-flake production could represent a better-scoured bottom of the river and thus more access to basal gravel cobbles. But the greatest core production was during the >80% level when the deposition rates appear to be at their lowest. The argument appears to get lost in the complex relationships between river meander cutting and regional hydrological responses such as flood volume. More attention needs to be paid to this question.

Material

The proportions of material types such as chert and rhyolite, or different categories of rhyolite, can indicate the local or non-local origin of lithic raw material. Eastman et al. (1995), for example, explored a source of green tuff about 20 km upstream in Durham County. The channel gravel at Neuse Levee is apparently a green, gray, or coarse gray rhyolite. Lautzenheizer and Eastman (1996) have documented cherts from the Durham-Wadesboro Triassic basins in the Piedmont–Coastal Plain transition zone. In a survey of collections, chert was found to rarely occur outside the Triassic Basins, but a "weathered core of heat-altered chert" was identified in an amateur collection in Wake County (Lautzenheizer and Eastman 1996:52). The source areas identified by Lautzenheizer and Eastman (1996) are about 40 km southwest of the project in Lee County. However, the Durham Triassic basin is as close at 15 km to the west. Chert is also found in the Research Triangle Park area (Lautzenheizer and Eastman 1996). Quartz is generally available in the bedrock in the Neuse River valley. Quartzite probably comes from the Triassic basin to the west as well.

A comparison of material types down through 20% levels shows that preferences for raw materials changed over time (Tables 9.4 and 9.5). The Archaic material preferences are dominated by rhyolite/granite. Toward the end of the Late Archaic, a shift toward quartzite is apparent. In the Woodland levels rhyolite, quartz, and quartzite yield to stronger preferences for chert. This pattern, combined with the core-biface results, suggests that the Late Woodland occupants of Neuse Levee were in some sense more mobile than the Early and Middle Woodland populations. Of course the lithic materials perspective has to be combined with the geomorphic perspective. It seems likely that the local rhyolite was not used in the Late Woodland because it was less accessible due to silting of the channel

Table 9.4. Neuse Levee Material Types by 20% Levels, Row Percents.

Material		Depth, 20% Levels					
		<20	20–40	40–60	60–80	>80	Total
Rhyolite	Count	284	384	2509	3943	2513	9633
	Row %	3%	4%	26%	41%	26%	100%
Quartz	Count	35	31	31	90	55	242
	Row %	15%	13%	13%	37%	23%	100%
Quartzite	Count	1	2	32	8	3	46
	Row %	2%	4%	70%	17%	7%	100%
Chert	Count	90	151	63	31	10	345
	Row %	26%	44%	18%	9%	3%	100%
Total	Count	410	568	2635	4072	2581	10266
	Row %	4%	6%	26%	40%	25%	100%

Chi-square=1719.5, df=12, p<.0001.

Table 9.5. Neuse Levee Material Types by 20-cm Levels, Expected Values.

Material		Depth, 20% Levels					
		<20	20–40	40–60	60–80	>80	Total
Rhyolite	Count	284	384	2509	3943	2513	9633
	Expected	385	533	2473	3821	2422	9633
Quartz	Count	35	31	31	90	55	242
	Expected	10	13	62	96	61	242
Quartzite	Count	1	2	32	8	3	46
	Expected	2	3	12	18	12	46
Chert	Count	90	151	63	31	10	345
	Expected	14	19	89	137	87	345
Total	Count	410	568	2635	4072	2581	10266
	Expected	410	568	2635	4072	2581	10266

Chi-square=1719.5, df=12, p<.0001.

(see Chapter 2). Thus the apparent mobility could have been enforced on a permanently resident population in the sense that they had to go elsewhere to acquire lithics.

A particularly intriguing question is whether the Early Woodland use of quartzite at Red Hawk Run correlates with the episode of quartzite preference at Neuse Levee. A process could be imagined, should the quartzite observed in Wakefield Creek be limited to that area, in which attention shifted to the Falls of the Neuse area in the late Late Archaic or Early Woodland, perhaps because of fishing there, or simply because of increased use of the river for transportation. As a result of better acquaintance with the upstream reaches of the river, travelers passing by Neuse Levee could have brought along quartzite, some of which would have remained at the site.

During an Early Woodland component at Red Hawk Run, knappers were apparently relying on quartzite more than on imported rhyolite. It is likely that the rhyolite there too came from the river, while the more popular quartzite was from the nearby tributary. It could be that the high deposition rate measured at Neuse Levee during the Early Woodland was also reflected in inaccessibility of rhyolite at Red Hawk Run. Differences in material variations with depth within the Wakefield sites showed that materials changed with level. Furthermore, changes became more pronounced up the valley; the tendency to change from rhyolite to quartz or quartzite between the Archaic and Woodland periods was strongest in 31WA1380 at the upper end of the watershed. This a wide time span, represented by Guilford, Savannah River, Eared Yadkin, and Wakefield point components. Neuse Levee spans the latter three of these components and adds a Late Woodland occupation. It too shows a shift to quartzite and quartz. The added definition, perhaps made visible by the deeper stratigraphy at Neuse Levee, is the shift first to quartzite in the Late Archaic-Early Woodland, followed by a shift to quartz.

In addition to the variation in lithic material types between major categories of rock such as quartz and rhyolite, substantial variation was observed in the rhyolite/granite material itself. This was coded by color, as the most accessible means of distinguishing the rhyolite subcategories (Table 9.6). Grain was also considered in the case of the coarse gray rhyolite.

Table 9.6. Rhyolite x Depth, 20% Levels Cross-Tabulation, Expected Values.

Color		Depth, 20% Levels					
		<20	20–40	40–60	60–80	>80	Total
Tan	Count	1	6	18	39	37	101
	Expected	2.8	4.0	26.4	41.4	26.4	101
Brown	Count	16	28	30	116	56	246
	Expected	6.9	9.7	64.3	100.7	64.3	246
Light gray	Count	16	15	287	370	172	860
	Expected	24.2	33.8	224.9	352.2	224.9	860
Gray	Count	5	4	18	50	24	101
	Expected	2.8	4.0	26.4	41.4	26.4	101
Dark gray	Count	13	9	9	95	121	247
	Expected	6.9	9.7	64.6	101.1	64.6	247
Green	Count	170	272	2059	3128	2048	7677
	Expected	215.9	301.8	2007.8	3143.7	2007.8	7677
Black	Count	33	25	4	1	2	65
	Expected	1.8	2.6	17.0	26.6	17.0	65
Bluish gray	Count	6	0	20	54	8	88
	Expected	2.5	3.5	23.0	36.0	23.0	88
Reddish brn.	Count	1	0	5	16	13	35
	Expected	1.0	1.4	9.2	14.3	9.2	35
Gray coarse	Count	8	17	51	47	20	143
	Expected	4.0	5.6	37.4	58.6	37.4	143
	Count	269	376	2501	3916	2501	9563
	Expected	269	376	2501	3916	2501	9563

Table 9.7. displays the differences between expected and observed values from Table 9.6. The categories of rhyolite exhibiting greater than expected values are assumed to be preferred during that time period. This is in the sense that extra effort was expended to acquire them, or that some other circumstance led to a proportional increase in their use such as the territorial range within which Neuse Levee fell. The table is sorted into categories that appear exclusively in the Archaic or Woodland, or are shared by them to show clusters of temporal changes in rhyolite preferences between phases. Although still a complicated array of rhyolite material types, it is easy to see that the variety of rhyolite subcategories preferred at Neuse Levee was greatest during the middle Late Archaic and late Late Woodland. This could be taken as a suggestion that it was during these times that Neuse Levee was incorporated within the largest trading spheres or territories. The intervening phase of more restricted utilization would reflect less mobility or more restricted trade relations. It could be important that the period of chert use (see above) corresponds to the period of black rhyolite use, both suggesting more intense relations with the Piedmont to the west in the Woodland.

Table 9.7. Expected-Observed Values for Rhyolite Preferences x Depth, 20%.

Rhyolite Color	Period	Depth, 20% Levels					
		<20%	20–40%	40–60%	60–80%	>80%	Total
		Late Woodland	Early Woodland	Late Late Archaic	Middle Late Archaic	Early Late Archaic	
Tan		–2	2	–8	–2	11	101
Reddish brown	Exclusively Archaic	0	–1	–4	2	4	35
Gray		2	0	–8	9	–2	101
Light gray		–8	–19	62	18	–53	860
Green		–46	–30	51	–16	40	7677
Dark gray		6	–1	–56	–6	56	247
Coarse gray	Shared by Woodland and Archaic	4	11	14	–12	–17	143
Bluish gray		4	–4	–3	18	–15	88
Brown		9	18	–34	15	–8	246
Black	Exclusively Woodland	31	22	–13	–26	–15	65
Number of Categories		5	3	3	5	4	

Although green rhyolite, the most frequently used material by far, it is present in all periods, its preference was greatest during the Archaic and its use in the Woodland much diminished. The many tools used during the Archaic were made almost exclusively of the green rhyolite (see below). An interesting material to evaluate relative to material availability is the coarse gray rhyolite, nearly or actually a granite. Rhyolite and granite are chemically the same material, but the granite cooled more slowly and therefore has a coarser crystalline structure. The coarse gray rhyolite was clearly a local material, as it was found as large primary flakes on the Archaic workfloors. Because it is so coarse, it could be taken as a sign that high-quality local material was in such short supply that even extremely coarse-grained material would at least be tested for use. Coarse gray has its highest frequency of appearance during the late Late Archaic, and it also has higher than expected values in the Woodland, though the frequencies are not impressive. The increased use of coarse gray can be taken as an index of scarcity of local material, and perhaps explains the greater reliance on imported materials from the Piedmont.

The dark rhyolite is a good candidate for determining direction of material acquisition from among the rhyolite categories. Since volcanic features are only to the west in the Piedmont, it must come from the west. The distribution of this material through time suggests very little contact with the Piedmont during the Archaic and increasing contact in the Woodland (see Table 9.5 for frequencies). The implications for direction should be the same as those for chert from the Triassic basins.

Flake Fragmentation

The amount of fragmentation that flakes are subjected to measures knapping methods, quality of material and reshaping for use, and approach to use after manufacture. However, a significantly different proportion of flake fragments could be taken as an indication of the intensity of flake reprocessing or extended use. For example, on Wakefield Creek, site 31WA1390 had the highest proportion of medial fragments. At this same site point medial fragments were also highest, and were thought to be an indicator of rigorous use under pressing conditions. Site 31WA1390 also had the highest number of medial biface fragments. This finding was taken to mean that the site, probably a hunting station associated with the riparian-valley wall vegetation transition, generated a general rigorous lithic use regime that resulted in repeated breakage of points, bifaces, and flakes without pause to rehaft tools. The overall assemblage at Neuse Levee reflects a remarkably similar flake fragment distribution (Table 9.8).

Table 9.8. Flake Fragmentation by Sites on Flake Fragments.

Row %s

Site	Platform	Medial	Terminal	Whole	Total	N
31WA1376	8	2	19	71	100	347
31WA1390	8	9	26	58	100	470
31WA1380	10	6	23	61	100	999
31WA1137	6	10	27	57	100	7726
Total	6	9	26	58	100	9542

Frequencies

Site	Platform	Medial	Terminal	Whole	Total	N
31WA1376	28	7	67	245		347
31WA1390	37	40	121	272		470
31WA1380	102	58	232	607		999
31WA1137	494	791	2076	4365		7726
Total	661	896	2496	5489		9542

The platform end fragments are slightly lower (about 2%) than at 31WA1390. The rest of the distribution is virtually identical to 31WA1390, presumed to be the most mobile camp of the set. It differs most from Red Hawk Run (31WA1376), the near-riverside fishing camp, which might be anticipated to be most like Neuse Levee.

A closer examination of the vertical, inter-level structure in the Neuse Levee flake fragment assemblage shows that the higher than expected frequencies of flake fragments trend from shatter, chunks, and platform fragments in the Archaic to whole flakes and medial fragments in the Woodland (Table 9.9). Since terminal and platforms ends of flakes are sometimes snapped off to render the medial fragment more usable, the pattern suggests a shift from on-site tool manufacture, with the terminal and platform fragments left behind, to tools being brought in from elsewhere and the medial fragment and whole flake tools being left. As in materials and core-biface technology, the middle levels of the Archaic strata resemble the Woodland more than the lowest or latest Archaic levels. It seems rather like the mid-range Archaic levels are presaging the characteristics of the Woodland levels, or experienced oscillations (see discussion in ceramic Chapter 9).

No attempt was made in the analysis to account for imponderables such as trampling. However, in soft bank sediments, this source of flake modification could be negligible.

Reduction Sequence

The reduction sequence stage of flakes in a site reflects its proximity to a raw material source, and thus how much difficulty is involved in gathering raw material. The alternative to a local source is preformed blanks, which must be carried to a site from a distant quarry and thus release only secondary and tertiary flakes on site. In another perspective, the importance of the site is suggested by whether people were willing to bring quantities of prepared material to a site that is remote from a source. If no source is nearby, a high proportion of tertiary flakes in a site could be taken to imply mobility of the inhabitants (see also core-biface flake discussion).

Although the percentages of primary and secondary flakes at Neuse Levee are well above those at the Wakefield sites (Table 9.10), they are surprisingly low for a quarry site. All of the Wakefield sites contain nearly 90% or more of tertiary flakes, while Neuse Levee has less than 70%. A comparison with another quarry site would be instructive. In the Lee County chert quarry (Lautzenheizer and Eastman 1993, 1996), the number of primary flakes was much lower than at Neuse Levee. This could be in part because the standard for primary flakes was set at 75% cortex in the Lautzenheizer and Eastman (1993)

Table 9.9. Flake Fragmentation x Depth, 20% Levels, Cross-Tabulation.

Flake Fragmentation		Depth, 20% Levels					Total
		<20	20–40	40–60	60–80	>80	
Medial	Count	54	61	188	294	194	791
	Expected	31.5	43.7	203.2	314.0	198.7	791.0
Whole	Count	231	296	1096	1768	974	4365
	Expected	173.6	241.2	1121.1	1732.6	1096.5	4365.0
Terminal	Count	67	127	519	825	538	2076
	Expected	82.6	114.7	533.2	824.0	521.5	2076.0
Chunk	Count	11	14	179	223	109	536
	Expected	21.3	29.6	137.7	212.7	134.6	536.0
Platform	Count	18	25	143	165	143	494
	Expected	19.6	27.3	126.9	196.1	124.1	494.0
Shatter	Count	27	44	510	797	619	1997
	Expected	79.4	110.4	512.9	792.6	501.6	1997.0
Total	Count	408	567	2635	4072	2577	10259
	Expected	408.0	567.0	2635.0	4072.0	2577.0	10259.0

Chi-square=220.2, df=20, p<.0001.

study of 31LE83, rather than at 50% as in this study. The percentage of primary flakes ranks with the lowest of the Wakefield sites.

Through the levels the Neuse Levee reduction stages with higher than expected values change from primary in the early part of the Archaic levels to secondary in the Late Woodland stratum (Table 9.11). The intervening phases are tertiary flakes. This generates a chi-square of p=.042, so site assemblage drifted over time from an on-site mode of lithic operation to one in which the lithics were imported to the site.

Table 9.10. Sites by Reduction Stage of Flakes (Type).

Row %s

Site	Primary	Secondary	Tertiary	Total	N
31WA1376	4	8	88	100	439
31WA1390	0	2	98	100	516
31WA1380	0	3	97	100	1077
31WA1137	16	16	68	100	6343
31LE83	1	5	94	100	2342

Frequencies

Site	Primary	Secondary	Tertiary	Total	N
31WA1376	16	37	386	100	439
31WA1390	2	8	506	100	516
31WA1380	3	31	1043	100	1077
31WA1137	997	1032	4282	100	6311
31LE83	31	123	2188	100	2342

Table 9.11. Flake Reduction Stage x Depth (20-cm Levels) Cross-Tabulation.

Flake Reduction State		Depth, 20% Levels					
		<20	**20–40**	**40–60**	**60–80**	**>80**	**Total**
Secondary	Count	41	46	282	375	288	1032
	Expected	33.8	49.2	265.9	404.4	278.6	1032
Tertiary	Count	133	206	1124	1701	1118	4282
	Expected	140.4	204.2	1103.2	1677.9	1156.2	4282
Primary	Count	33	49	220	397	298	997
	Expected	32.7	47.6	256.9	390.7	269.2	997
Total	Count	207	301	1626	2473	1704	6311
	Expected	207.0	301.0	1626.0	2473.0	1704.0	6311

Chi-square=16.1, df=8, p=.042.

SUMMARY

To summarize, the flaking technology, either core or biface, flake materials, and reduction stage:

Neuse Levee has the most elevated frequency of core flakes of the Neuse Fall Line study sites. This suggests a relatively in-place location for making stone tools. However, over time the core-biface ratios varied, indicating that more mobile populations sometimes visited the site and brought lithics with them from other sources.

The middle levels of the Archaic and the later part of the Woodland appear to represent periods of greater mobility based on a proportionally greater presence of bifacing flakes. These levels in fact display commonality on a number of attributes leading to the suspicion that the conditions of the middle Archaic levels presaged Woodland activities.

Availability of local material in the Late Woodland could have been influenced by changes in the Neuse channel.

A quartzite connection might exist between Neuse Levee and Red Hawk Run. More research needs to be done on the spatial availability of quartzite in the area.

As at the Wakefield sites, an increased preference for quartz appeared during the Late Woodland.

Both black rhyolite and chert are resources in the Piedmont and appear in the same levels at Neuse Levee, suggesting more intense trading relations or travel patterns during the Late Woodland.

Increased use, or at least cobble testing, of coarse gray rhyolite in the late Late Archaic probably indicates a growing scarcity of locally available raw material. This could account for some of the increased popularity of imported material.

The fragmentation of flakes indicates that over time Neuse Levee became less a place of raw material extraction and a source of tools, and more a place to which tools were brought to be used. As in the other dimensions of change at Neuse Levee, the middle levels of the Archaic more resemble the Woodland and the other levels in the Archaic.

Over time the flake reduction stages of flakes drifted from primary to secondary, again supporting the contention that more material was being imported to the site rather than collected and reduced locally.